

## ABSTRACT

A nano-porous metal oxide semiconductor with a band-gap of greater than 2.9 eV in-situ spectrally sensitized on its internal and  
5 external surface with metal chalcogenide nano-particles with a band-gap of less than 2.9 eV containing at least one metal chalcogenide, wherein the nano-porous metal oxide further contains a phosphoric acid or a phosphate; and a process for in-situ spectral sensitization of nano-porous metal oxide semiconductor with a band-  
10 gap of greater than 2.9 eV on its internal and external surface with metal chalcogenide nano-particles with a band-gap of less than 2.9 eV, containing at least one metal chalcogenide, comprising a metal chalcogenide-forming cycle comprising the steps of: contacting nano-porous metal oxide with a solution of metal ions; contacting nano-  
15 porous metal oxide with a solution of chalcogenide ions; and subsequent to metal chalcogenide formation rinsing the nano-porous metal oxide with an aqueous solution containing a phosphoric acid or a phosphate.